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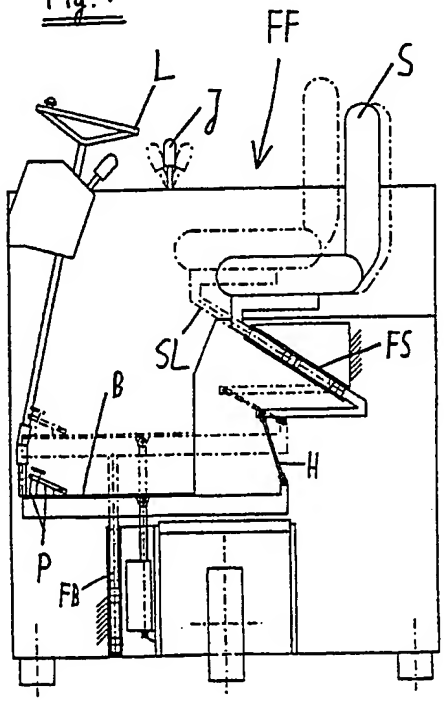
(54) Driving position

(57) A vehicle, in particular working vehicle, such as an industrial truck FF, in which the floor plate B and the pedals P are adjustable vertically and the driver's seat S is adjustable vertically and forwards to achieve an ergonomically favourable body position. One preferred embodiment provides a positive connection which moves the driver's seat S upwards and forwards when the pedals P are raised. The seat S and floor plate B may be moved by actuators controlled by a control circuit, and a memory may store data on seat and floor plate positions for a number of different drivers.

Fig.1



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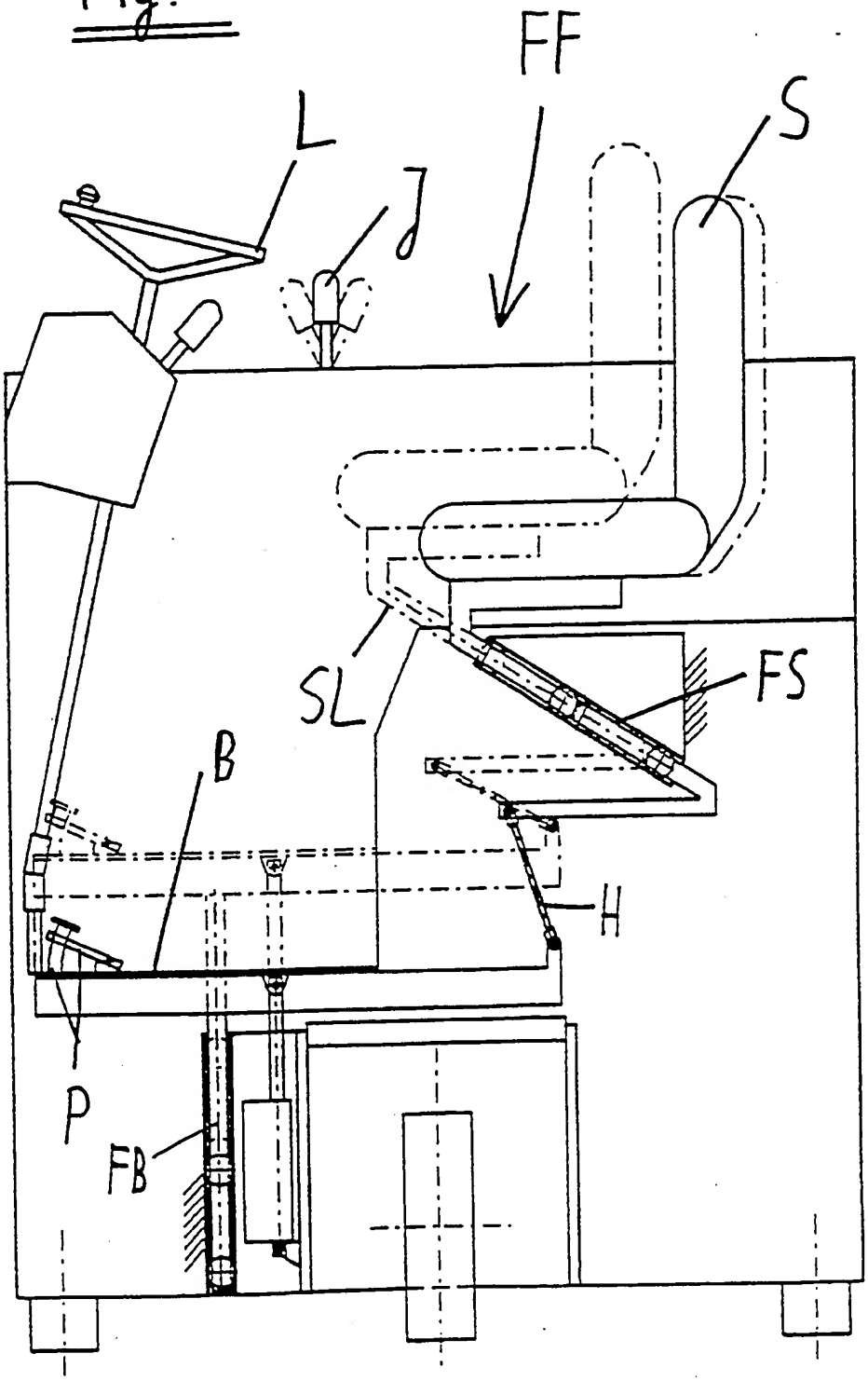
At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

Fig. 1



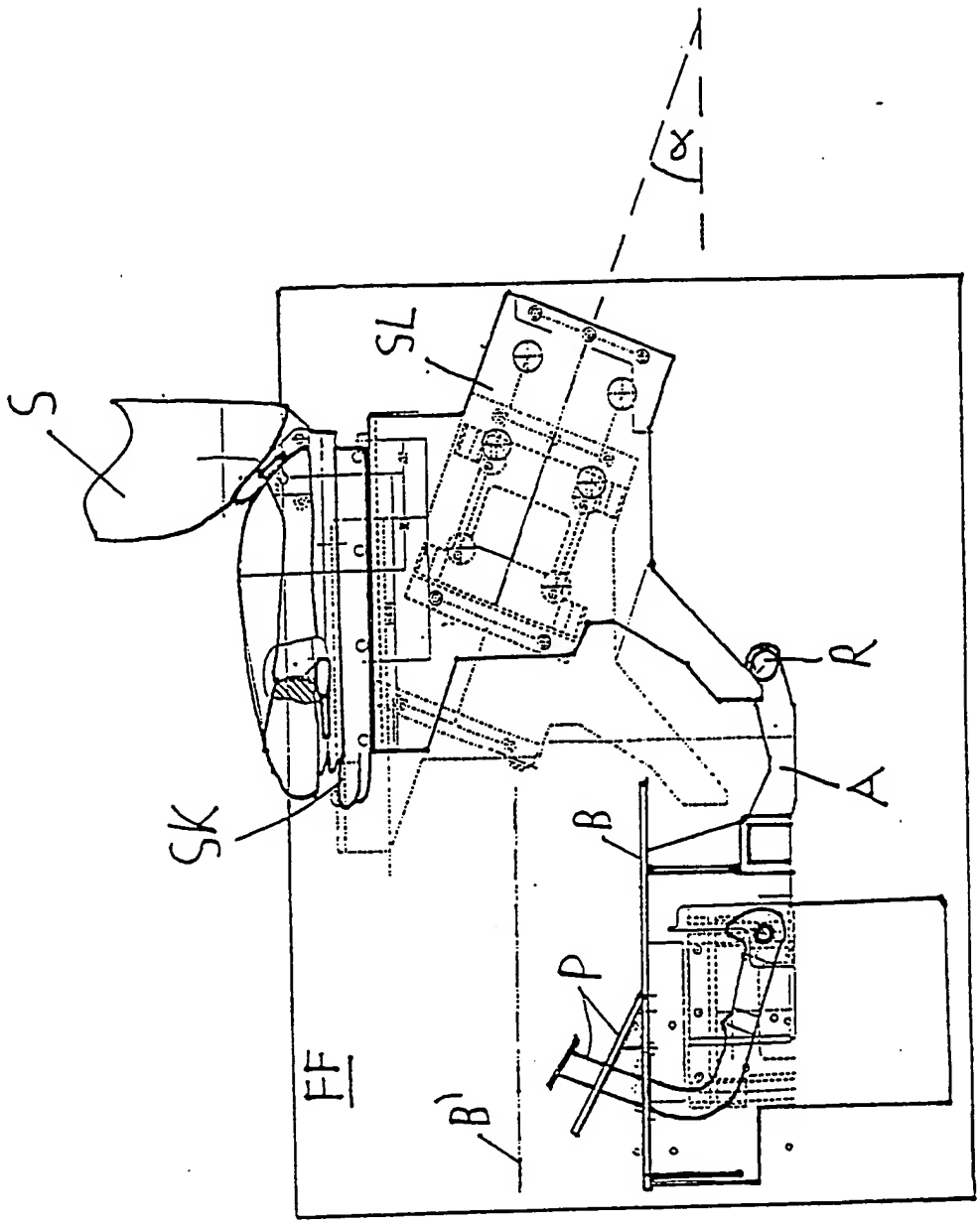


Fig. 2

DRIVING POSITION

The invention relates to vehicle driving positions, and particularly concerns a vehicle, in particular a working vehicle, such as an industrial truck, a tractor, a digger, a loader or a fork-lift truck. Such vehicles are generally equipped with hand controls, such as the steering wheel, a control console and/or a joystick, and foot controls, i.e. pedals, which are secured to a floor plate.

To accommodate drivers of differing heights, it has been usual for the driver's seat to be made adjustable both in the forward and rearward directions and in height, and adjustability in the angle of the backrest is generally also provided for. It is also known for the steering wheel to be tilted by being inclined or moved nearer to the driver. Even so, this did not always produce ergonomically optimum working positions for very tall or very short drivers.

Therefore, an object of the invention is to improve the driving position for a vehicle so as to create an ergonomically optimum driving position suitable for fatigue-free working both for tall and for short drivers conforming to the "tall man" and "short woman" definitions of DIN 33 408.

This object is achieved according to the invention by a vehicle with a driver's seat, hand controls such as a steering wheel and control console with a joystick, and a floor plate with foot controls, wherein the driver's seat is adjustable longitudinally and vertically relative to the vehicle chassis, and in the floor plate is adjustable vertically relative to the vehicle chassis.

The essence of the invention is the adjustability of both the driver's seat (or the seat bracket) longitudinally and vertically relative to the vehicle chassis, and the vertical adjustability of the foot controls. The adjustment possibilities according to the invention mean that tall and short drivers can be accommodated in an optimum driving position to reach the steering wheel, the (fixed) controls for the hand (e.g. to raise and lower a load) and the pedals for driving. Injuries due to incorrect posture are thus avoided or alleviated.

In one preferred embodiment the seat adjustment and the floor plate adjustment are rigidly coupled together so that when the floor plate is raised the seat is automatically adjusted obliquely upwards and forwards. This means that the driver's arms are always in a relaxed position and that he does not have to hunch or excessively stretch his body.

The adjustment of the driver's seat according to the invention can preferably take place through a slide on which the seat is secured either directly or by means of a seat bracket, the slide being movable on a guide rail angled obliquely forwards and upwards. Individual adjustment of the seat on the seat bracket is still possible for the driver. Thus, he can still adjust the seat forwards, rearwards, upwards, downwards relative to the seat bracket, and can vary the angle of the backrest, within certain limits. The angle of the slide guide rail in relation to the horizontal lies between 10° and 50°, preferably between 25° and 30°, and is 28° in the embodiment to be described later. This means that the controls for the hands and for the feet are always within reach without fatigue. This angle allows for the movement of the seat reference point from that for a "tall man" to

that for a "short woman" according to DIN 33 408 with the operator's right hand remaining on the control lever.

The coupling of the movements of the floor plate and the seat can be effected electrically for example; thus, the seat can be moved upwards and forwards by means of control motors; this movement can be effected according to the movement of the floor plate. Mechanical coupling systems are also possible, such as for example by means of cable, lever systems, gears or similar solutions, which ensure that when one component (seat or floor plate) is moved, the other component (floor plate or seat) is moved accordingly into the intended ergonomically advantageous position. The adjustment can be effected by means of electric motors, hydraulic or pneumatic motors, by manual force, by spring force or by gravity.

In a preferred embodiment, a scale or display is provided in association with a data input means, and a control circuit is operative in response to the data input means to control actuators which move the seat and floor plate relative to the vehicle chassis so that when the height of the driver is fed in to the data input means, the driver's seat and the floor plate are moved by the actuators into the ergonomically correct position for that driver.

The optimum adjustment of seat and pedals may be effected for example in that the driver sets his height on a scale, and as a result one or both of the elements move into the correct position. Alternatively, the driver may move the electrically operated floor plate to a mark which corresponds to his height, and the coupling of the seat and floor movements ensures that the seat automatically moves into the position which corresponds to an ergonomically correct driving position for that driver in the vehicle. The point at which the hand rests on the working

implements, e.g. on the lifting valves or on the joystick for operation of the lifting framework, remains spatially fixed, and the steering wheel always remains in the optimum position in relation to it. Expediently, additional functions such as driving direction control, horn control, etc. can conveniently be incorporated in the control lever for the lifting hydraulics in the resulting ergonomically determined position for the controls. Another advantage of the invention is that even when the driver is short, the driver's eye level remains at the intended height.

In one embodiment of the invention provision can be made for an access position which is particularly suitable for boarding. In this embodiment, a control circuit is operative to control actuators which move the seat and floor plate relative to the vehicle chassis, and when the handbrake is applied or the key is removed the floor plate and the driver's seat are moved into an access position which facilitates ingress to and exit from the vehicle.

The driver's seat and the floor plate can be brought into the access position automatically when the driver applies the handbrake and/or removes the key. An automated version can function as follows: once the driver has adopted the sitting position (actuating a seat switch) and been identified by entering a number, operating a key, or reading in the driver number (the driver number can also be used for other monitoring operations such as for example operating times), the seat and floor plate are automatically moved from the access position favourable for boarding to the ergonomically correct position for that particular driver. It is also possible to couple the adjustment of the steering wheel or control console with the parking brake, the key switch and the seat contact. After the equipment is switched off, the parking brake is

applied and the seat vacated, the steering wheel or control console adjustment is released (unlocked). The driver can push them aside to facilitate his exit from the vehicle, and also ease the subsequent entry of the next driver to the vehicle.

If the system according to the invention is coupled or suspended so that it floats relative to the vehicle chassis, the entire driving position is damped against shocks.

The invention will now be explained in detail, with reference to the accompanying figures, in which:

Figure 1 shows a rear view of an industrial truck; and

Figure 2 is a schematic view similar to Figure 1 of a second truck.

The two drawing Figures show diagrammatic views of driving positions with the seat and floor plate adjustable according to the invention.

In Figure 1, a rear view of an industrial truck FF with three wheels is seen. On this vehicle the driver is seated on the driver's seat S facing at right-angles to the direction of travel. The hand controls, such as the steering wheel L and the joystick J for operation of the lifting elements (not shown) are located in front of him. The pedals P for controlling the speed of travel and for braking are secured to the floor plate B. The floor plate B is mounted in the guide FB and can be raised or lowered by an electric motor. The lowered position for tall drivers is shown by the continuous line. The raised position for short drivers is shown by the broken line.

Here, the driver's seat S is secured on the slide SL which is secured in the guide FS on the vehicle FF. The guide FS allows movement of the driver's seat S obliquely upwards and forwards or obliquely downwards and rearwards

("forwards" and "rearwards" here being relative to the direction in which the driver faces). In this embodiment a mechanical lever H links the two adjustable elements, so as to couple their movement together. When the floor plate B moves upwards, the lever H also raises the slide SL together with the driver's seat, this upward movement of the driver's seat being overlaid by a forward movement through the guide FS which results in the driver moving closer to the steering wheel L when the floor plate B is moved upwards. This ensures that short drivers can also reach the steering wheel L and the joystick J in optimum conditions. The uppermost position of the driver's seat S is shown by broken lines in the drawing.

Figure 2 shows another embodiment of an industrial truck FF on which are disposed the adjustable elements, namely the floor plate B with the pedals P and the slide SL with the seat bracket SK and the driver's seat S. The floor plate B is shown in its lowermost position. The uppermost position for shorter drivers is indicated by B'. The slide SL is shown in the position for tall drivers, the position of the slide SL for short drivers is shown by the dash-dotted line. Also visible is the angle α of the guide for the slide SL which ensures that when the pedals P are raised, the driver's seat S is also moved upwards and forwards (relative to the driver) when the seat is adjusted for a shorter driver. The coupling of the movements of the floor plate B with the slide SL is also effected mechanically here by means of an arm A which is secured to the floor plate B and carries a roller R at its tip. This roller R slides up an incline on a projection of the slide SL and urges the projection, and thus the slide SL and seat bracket SK, upwards and forwards. As the floor plate B is lowered, the slide SL returns back down the guide rail by gravity taking the seat bracket SK and seat S with it. An

embodiment is possible, but not shown, in which the roller R is guided in a slot of the slide SL, so as to provide positive driving of the slide SL in both the raising and lowering directions. When the floor plate B moves downwards, the seat S is then drawn rearwards and downwards with it. In this embodiment, forward movement of the driver's seat due to sudden acceleration or deceleration is avoided, as the slide SL is prevented from moving along the guide rail unless the floor plate B is moved.

CLAIMS

1. A vehicle, in particular working vehicle, such as an industrial truck, tractor, digger or loader, in which hand controls such as a steering wheel and control console are fixedly mounted to the vehicle body, and a driver's seat and a floor plate with foot controls mounted thereto are adjustably mounted to the vehicle body, wherein the driver's seat is adjustable vertically and longitudinally and the floor plate is adjustable vertically.

2. A vehicle according to claim 1, wherein the movement of the seat relative to the vehicle chassis is coupled with the movement of the floor plate relative to the vehicle chassis, so that when the floor plate (B) is raised, the driver's seat (S) is moved forwards and upwards.

3. A vehicle according to claim 1 or claim 2, wherein the driver's seat is secured to a slide which can be moved on a guide which is angled obliquely upwards at an angle of inclination (α) of between 10° and 50° to the horizontal.

4. A vehicle according to claim 3, wherein the guide is angled obliquely upwards at an angle of inclination (α) of between 25° and 30° to the horizontal.

5. A vehicle according to claim 2, 3 or 4, wherein the seat and floor plate are moved relative to the vehicle chassis by electric motors, hydraulic or pneumatic motors, by hand, by spring force or by gravity.

6. A vehicle according to any of claims 2 to 5, wherein the coupling between the two adjustable elements is effected mechanically, electrically, hydraulically or pneumatically.

7. A vehicle according to one of the preceding claims, wherein a scale or display is provided in association with a data input means, and a control circuit

is operative in response to the data input means to control actuators which move the seat and floor plate relative to the vehicle chassis so that when the height of the driver is fed in to the data input means, the driver's seat and the floor plate are moved by the actuators into the ergonomically correct position for that driver.

8. A vehicle according to one of the preceding claims, wherein a control circuit is operative to control actuators which move the seat and floor plate relative to the vehicle chassis, and wherein when the handbrake is applied or the key is removed the floor plate and the driver's seat are moved into an access position which facilitates ingress to and exit from the vehicle.

9. A vehicle according to one of the preceding claims, including a seat switch to detect the presence of a driver, an identification device operable by the driver to input driver identification data, and a control circuit operative in response to the seat switch and identification device to control actuators which move the seat and floor plate relative to the vehicle chassis, and a memory associated with the control circuit and capable of storing data on the positions of the seat and floor plate associated with respective driver identification data, the arrangement being such that on actuation of the seat switch and operation by the driver of the identification device, the control circuit causes the actuators to move the floor plate and the driver's seat into the previously stored position associated with the respective driver identification.

10. A vehicle according to claim 9, wherein the steering wheel and/or a control console are unlocked or swung away in the access position.

11. A vehicle according to any of the preceding claims, substantially as described herein with reference to Figure 1 or Figure 2 of the accompanying drawings.

Patents Act 1977 Examiner's report to the Comptroller under Section 17 (The Search report)	Application number GB 9507757.4
Relevant Technical Fields (i) UK Cl (Ed.N) B7B; A4L (ii) Int Cl (Ed.6) B60N	Search Examiner R HOWE Date of completion of Search 4 JULY 1995
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ONLINE: WPI	Documents considered relevant following a search in respect of Claims :- 1-11

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